Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	WT Docket No.97-12
	)	
Amendment of Amateur Service	)	RM-8737
Rules to Provide For	)	
Greater Use of Spread	)	
Spectrum Communication	)	
Technologies	)	

To: The Commission

COMMENTS OF ROBERT A. BUAAS, K6KGS

Background

I have been licensed in the Amateur Radio Service since 1953. I earned my Amateur Extra Class license in 1961, when I was age 17. For most of my lifetime, I have enjoyed the privilege of experimenting with radio communications, a pasttime I truly love. In addition, I hold a Special Temporary Authorization (STA) dated December 27, 1994, that permits experimentation with any Spread Spectrum (SS) technology in all Amateur spectrum above 50 Megahertz. My involvement with Amateur SS dates back to its original contemplation by AMRAD, in whose STA I participated. I have contributed to the development of successful commercial Part-15 SS systems, and I am a charter member in IEEE P802.11 (the Wireless LAN Ethernet Standard development project).

Introduction

I view the adoption of the Rules Change contained in the proceeding with considerable dismay. While its claimed goal is to simplify and encourage SS, it in fact would contribute to the reduction or elimination of its use.

Precious few of the commenters in this proceeding have any personal practical experience with SS. I find it curious that the spokespeople for the weak-signal interests, particulary Tynan of AMSAT, continue to present their conjectures of doom as fact, without bothering to conduct any realistic tests to validate their claims. Recently, I was invited to speak at the NASA Jet Propulsion Laboratory to Amateurs interested in the current state of affairs in Amateur SS. That opportunity was particularly rewarding, in that some of those same members are responsible for the SS technology used in NASA's deep space weak-signal

communications. The concerns of the FM/repeater community are also unfounded, and I address their situation in the Discussion below.

That Commercial interests, particulary Part-15 promoters, seek parity with Amateur operators in the context of this proceeding seems to me to be entirely inappropriate. Metrocom and Symbol Technologies wish to advance their business interests at the expense of Amateur Radio operators opportunity and earned privilege at advancing the State of the Art in Radio Communication. Such is one of the Purposes of the Amateur Radio Service. Part-15 proponents knew and continue to know the Rules and relative priorities of the two Services when they chose to enter the business. Such are the risks of business, and they deserve to abide by their decisions.

Summary

I urge that Commission turn aside this proposal in favor on one which implements the spirit of the environment provided for participants of the STA(s), to wit, (a) operation in any Amateur bands at 50 MHz and above without restriction, (b) use of any coding and/or modulation technology imaginable, (c) permit " in-mode" identification, and (d) eliminate restrictions, thus providing encouragement for designs that reduce interference. I made the same recommendation in my filings on RM-8737. To date, noone has come forward with any evidence that Amateur SS emissions have interfered with anyone.

While I admire the elegance of Phil Karn's proposal for Automatic Power Control (I enjoyed the several discussions we had during its gestation), and I encourage its use, I cannot agree that the specifics of this proposal belong in the Rules. We already have a provision that says: " Use Minimum Power." Rules should apply to ALL systems, not just new ones. There are so many violations of this Rule now, I find it entirely inappropriate that only SS should be saddled with a proposal this specific. After all, it is the very nature of the specificity of the current Part 97 Rules for SS that have all but prevented its use.

Spectral Partitioning, of the variety practiced currently, also is without merit. What will happen when the day comes that a novel weak-signal application wishes to use the very SS technology now proven for deep space, yet the Rules prevent it use in spectrum reserved for weak-signals? Such Rules have proven to be short sighted. The results of this proceeding will affect Amateur Radio for at least a decade. Few of us have sufficient vision to see that distance into the future. Let history be our guide.

Discussion

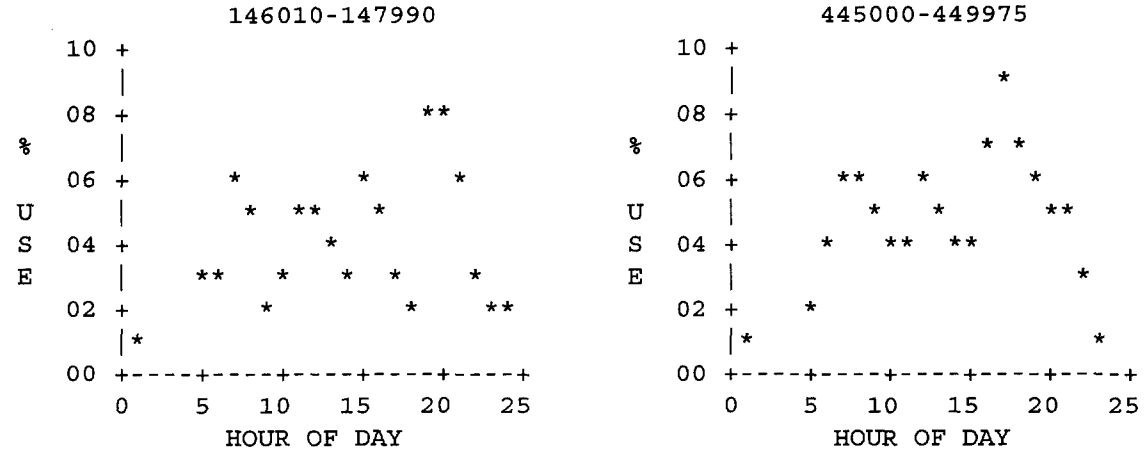
In this section, I wish to turn some illumination on the subject of conjectured INTERFERENCE to existing operations. This a popular topic,

to say the least. I have been the subject of some criticism from those who dispute my claims that properly designed SS system have minimum liklihood of causing interference. Most vocal has been the Repeater Coordination community, yet they have to conduct any independent studies or come forward with documented cases of interference. They certainly have the means and expertise to do their own tests, yet they refuse, and complain all the while.

Having once been a Frequency Coordinator, I understand their position, and their frustrations. They have only one degree of freedom, the Frequency Domain, in which to operate. Perhaps they have two, if one considers the Spatial Domain (stations that would otherwise interfere unacceptably, were it not for the distance or terrain that separates them). The degree of freedom they don't command is the Time Domain. Dealing in the Time Domain requires systems complexity that is currently beyond current Amateur practice. The consequence that Amateur repeaters cannot handle frequency agility has lead to the operational mentality that a Coordinated Repeater " owns" the frequency on which it operates, whether it is IN USE or NOT. Alternative use of its input frequency could mean denial-of-service to authorized repeater users, and thus is defined as INTERFERENCE. Notwithstanding, the Rules are very specific, saying that no Amateur station has any title to any particular frequency. Repeater Owners believe the contrary, and they act like it. Repeater Wars have been fought over single frequencies.

What is fundamentally interesting is the NOT part of the notion above. The prevailing attitudes have lead to particularly low levels of spectral utilization in the Amateur VHF and UHF bands. This is obvious to anyone who looks casually but critically at consecutive scans on the face of a spectrum analyzer. On any one scan, there are very few spectral lines representing current usage. The situation is very dynamic, as repeater transmitters activate and deactive at essentially random times in response to the needs of their respective users. Several years ago, when I began designing STA experiments for assessing the coexistance potential in " densely populated" repeater spectrum, I began collecting real-time utilization data, principally for use in simulations, testing the merits of a variety of frequency and time hopping patterns. This data validated my operational experiences that the interference to existing system was negligable.

Consider for a moment the age-old question: " Is there sound when a tree falls in the forest, if noone is around to hear it?" The following charts show that very little of the popular repeater spectrum is actually in use at any one instant. Conversely, much is available to time-agile systems on a minimum/non-interference basis. The vertical axis is percentage of total spectrum in use; the horizontal axis are the hours in a day. Predictably, certain times see more activity than others. What is not obvious is the low level of simultaneous demand. These charts show, even for the allegedly densely-populated Los Angeles area (for the most part, each of the 133 146-MHz and the 200 445-MHz repeater channels have multiple coordinations per channel), in the TIME domain, the spectrum utilization is well below ten percent (10%).



The charts contained in Appendix-A further elaborate on these findings. The first set of 24 charts show the contiguous part of the 2-Meter repeater band hour by hour. The presentation is useful in seeing the probability of collision FHSS systems would experience. The vertical axis shows the frequency of occruance; the horizontal axis shows the number of possible collisions. The second set of 24 charts show data taken simultaneously with the 2-meter data, but for the 445-MHz band. These data conclusively show why our experimental systems achieved no measurable impact. THERE WASN'T ANY IMPACT TO BE HAD.

Further, this situation is little different elsewhere.

It is easy to see why various Commercial interests have launched efforts to reallocate Amateur spectrum to their Service(s).

There is some good news here: given that Amateurs would embrace this technology, and rise to the technical challenges it poses (which are not minor), there need never again be denial of service for Amateurs needing to communicate. FH is one of the simplest and easiest SS systems in operation today. Most Amateur VHF/UHF transceivers contain all the elements needed to do FHSS. By design, they are not configured properly, and the software needed to acquire and maintain synchronization is missing. Most also require slight modifications to the Frequency Synthesizer.

Of course, if this mode catches on, there will be little need for Frequency Coordinators -- their power and prestige will be gone. Simple public databases on the Internet will serve to negotiate and declare code sequences and timebase references.

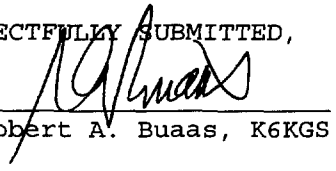
The examples given here are but few of the many possibilites for coding technology, SS representing a small piece along that continuum. My view is that the Amateur Rules should permit the widest possible interpretation and latitude.

Writing Rules requires VISION; we seem to lack the very thing we most need now.

Conclusion

Spread Spectrum is a complicated art. Even the simplest SS system designs have been, to date, beyond the technical reach of all but the most advanced Amateurs. Yet, it offers considerable promise, not the least of which is much better spectral utilization than is the current practice. Perhaps more importantly, Amateur Radio is one of few vehicles for encouraging young people into taking up a professional careers in Radio Engineering. Without the freedom to try new ideas, those individuals will turn elsewhere. The Internet is currently a powerful draw. Fewer and fewer radio engineers are entering the field from college. I believe that it is the Commission's responsibility to nurture this Service, not limit it or contribute to its demise. I urge you to see the detractors in their true light, and adopt the proposal I make in the Summary above.

RESPECTFULLY SUBMITTED,

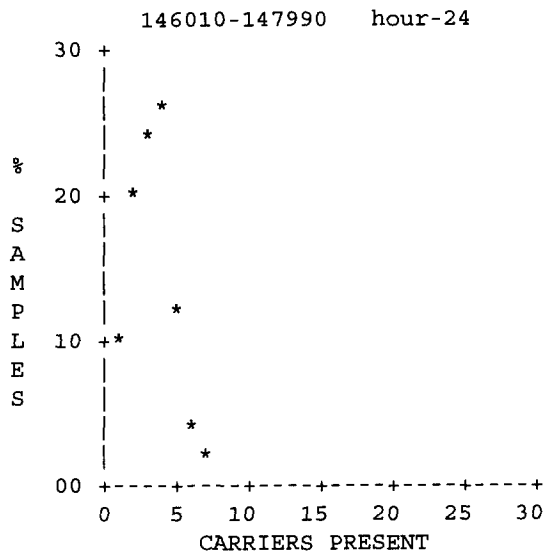
By 

Robert A. Buaas, K6KGS

May 2, 1997

Mailing Address:
10044 Adams Ave. #108
Huntington Beach, CA 92646

E-Mail: buaas@wireless.net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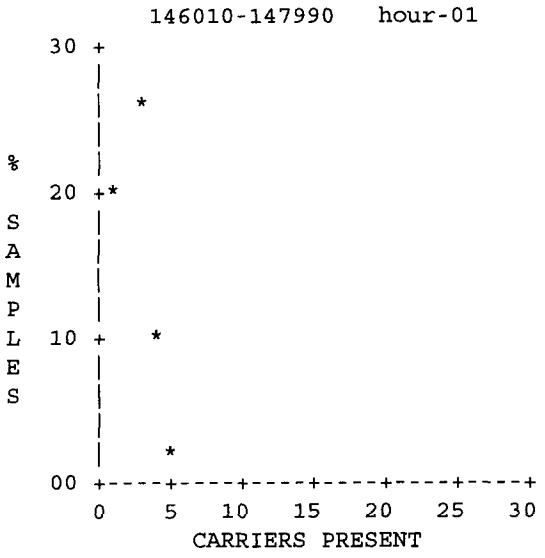
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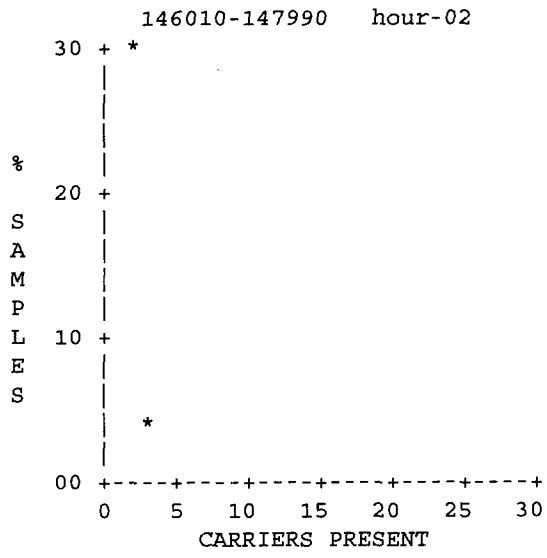
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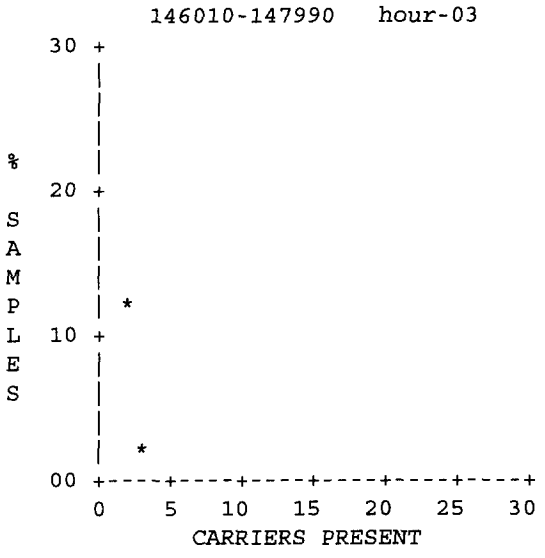
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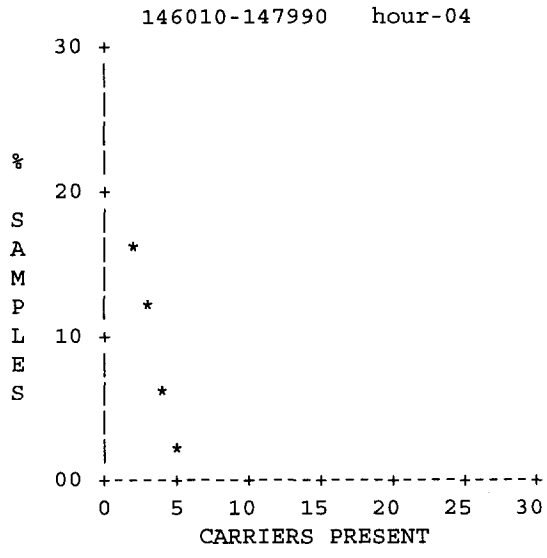
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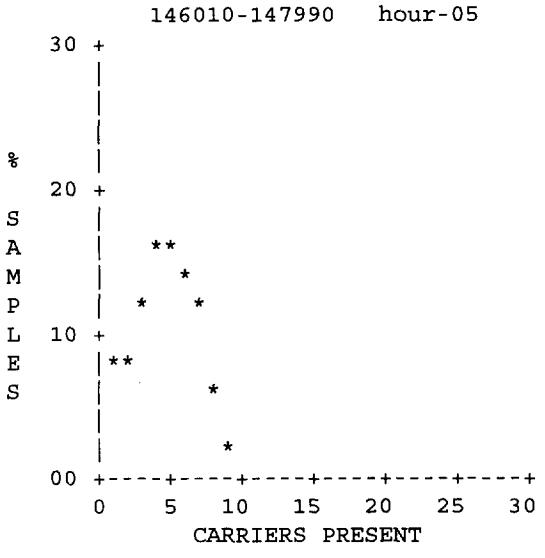
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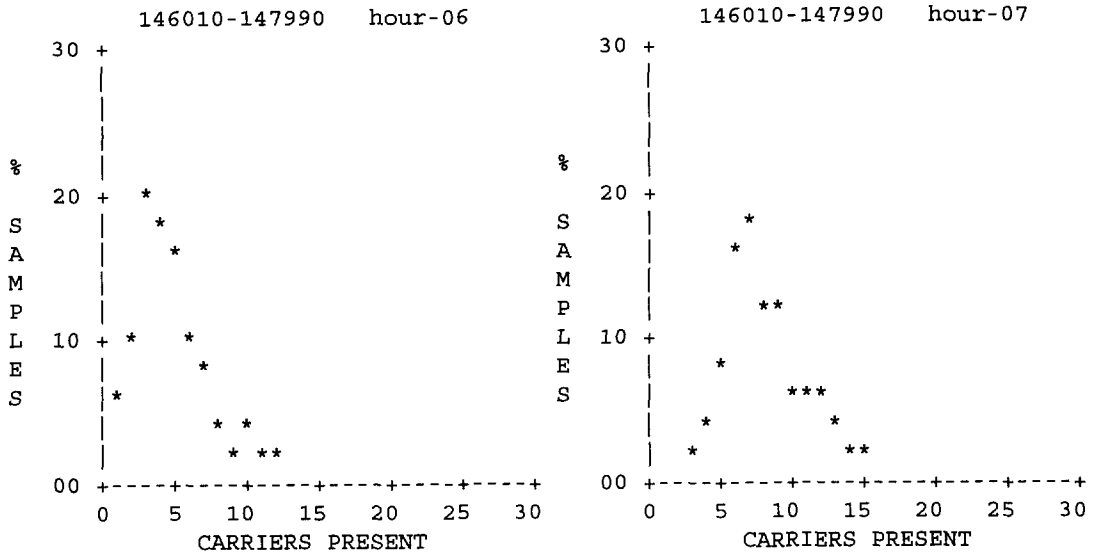
APPENDIX-A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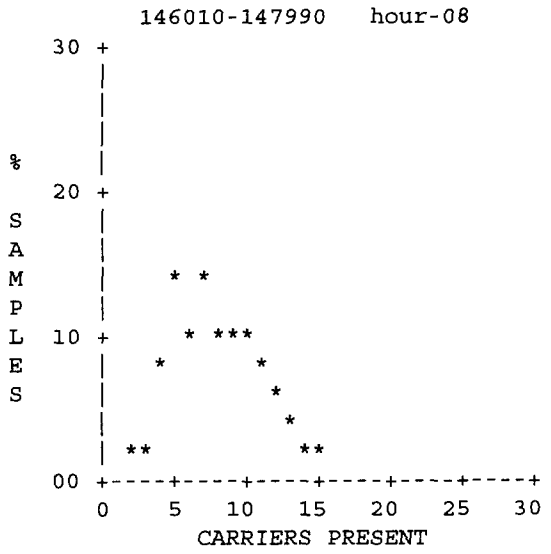
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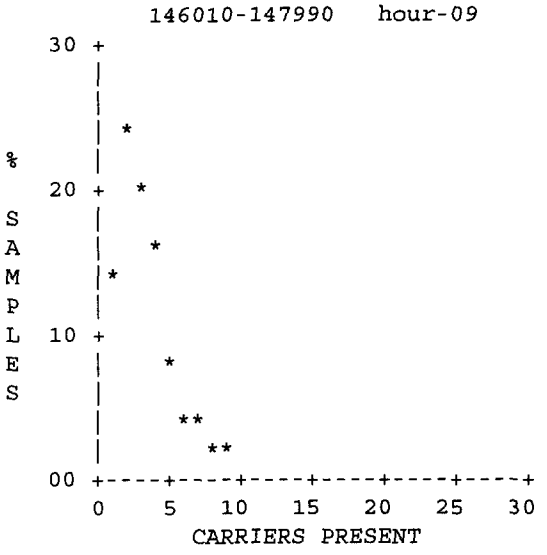
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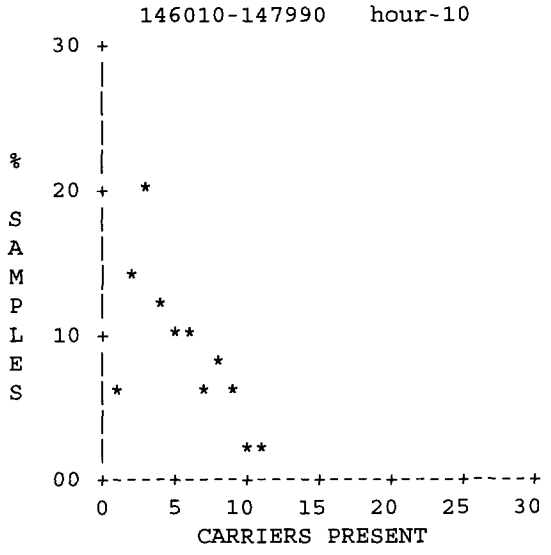
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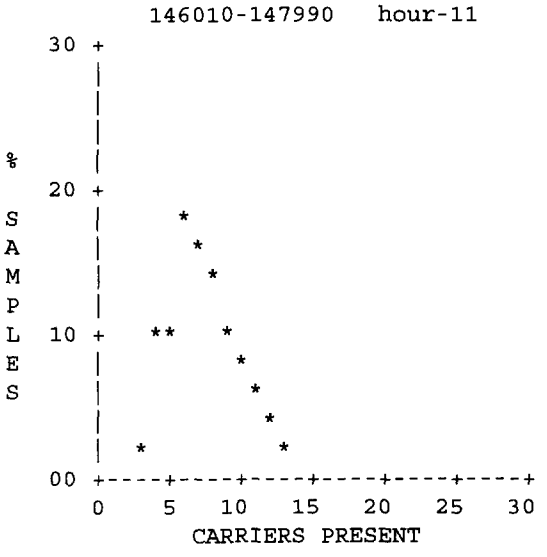
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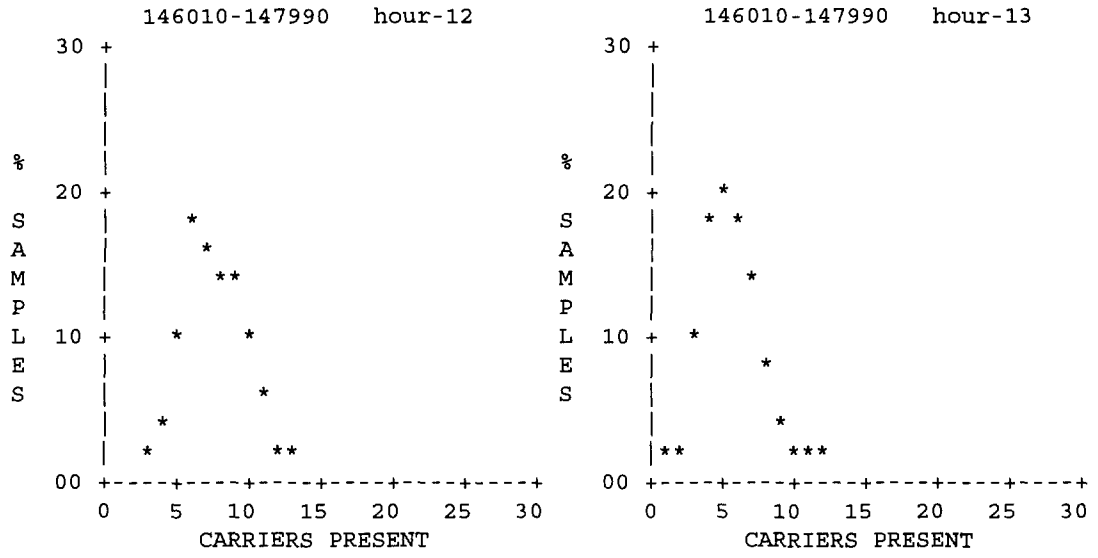
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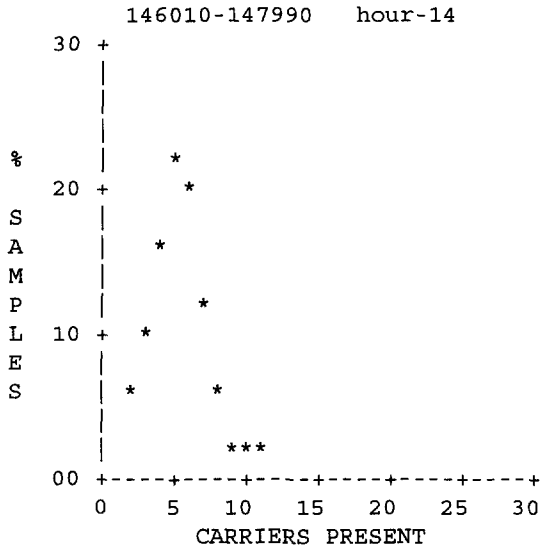
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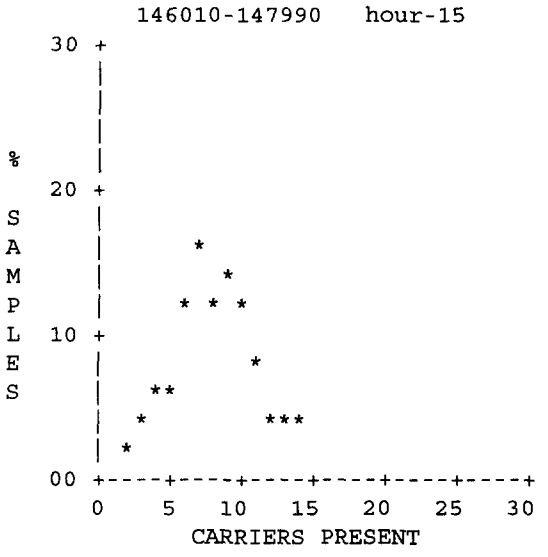
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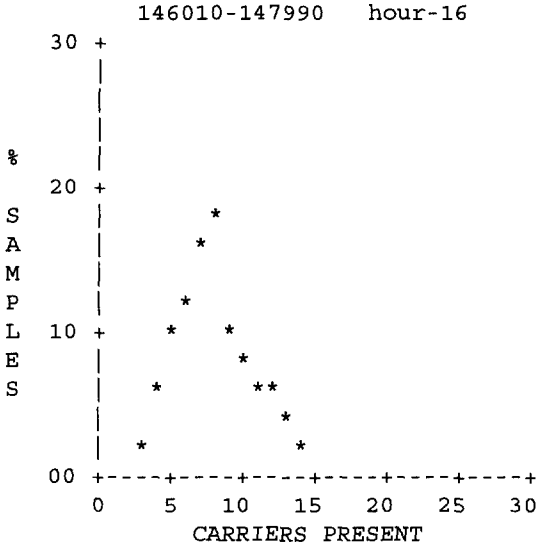
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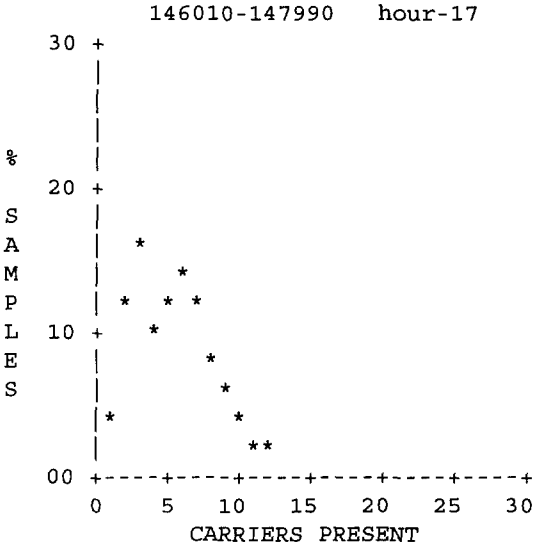
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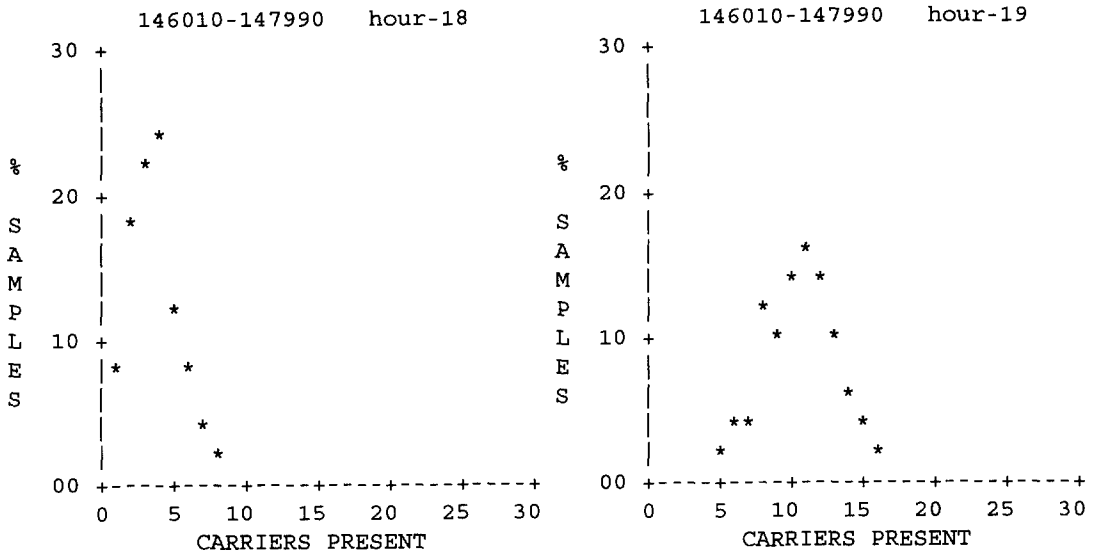
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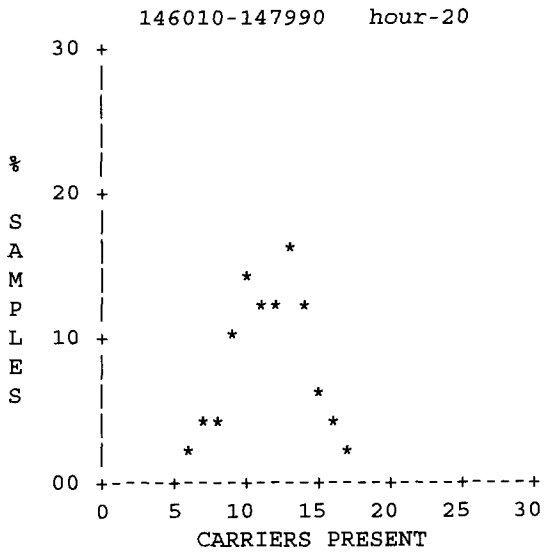
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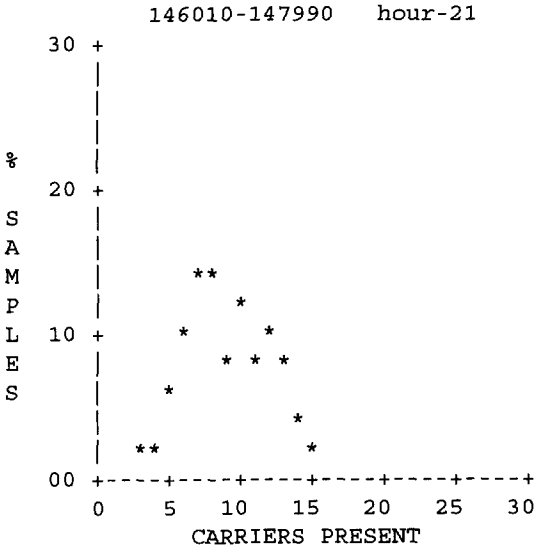
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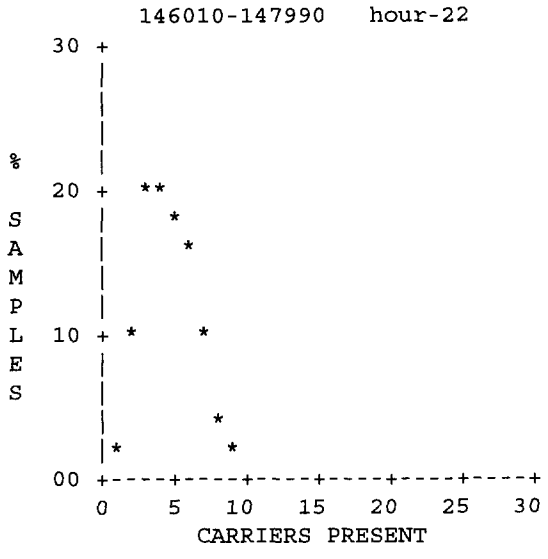
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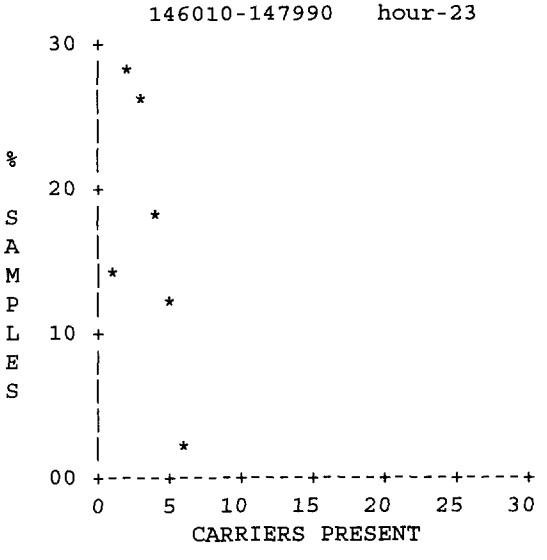
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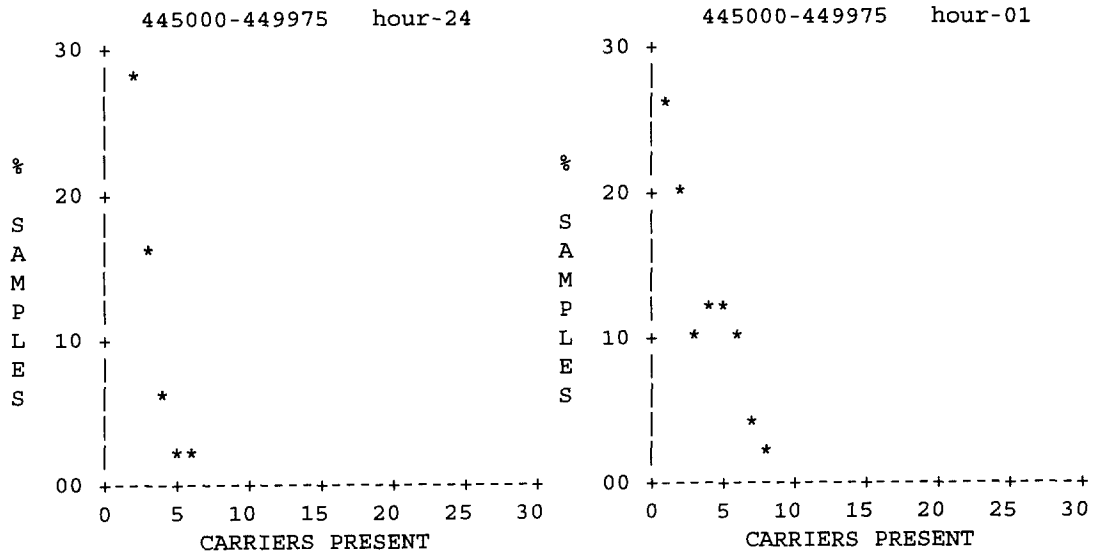
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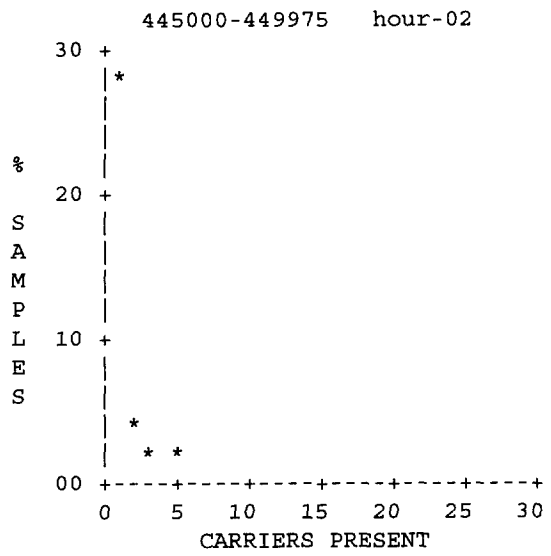
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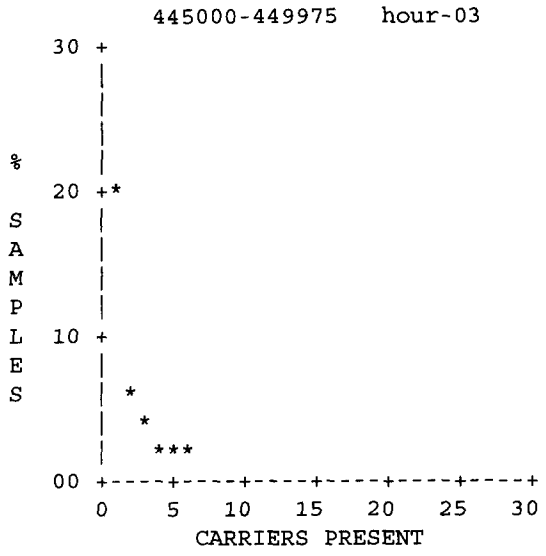
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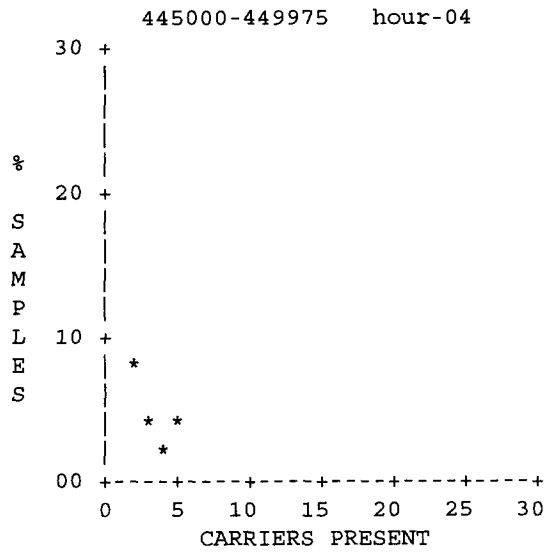
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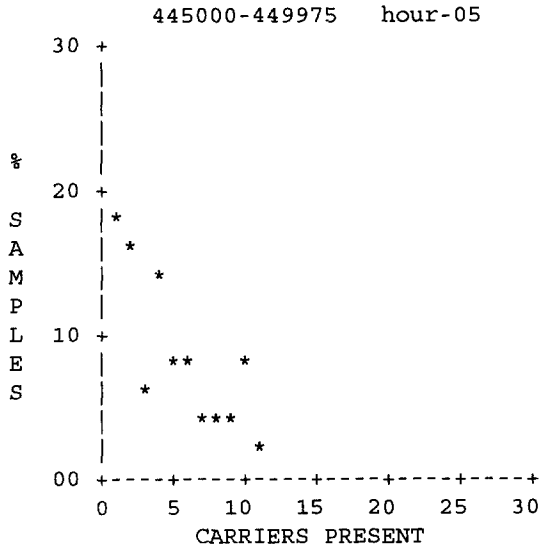
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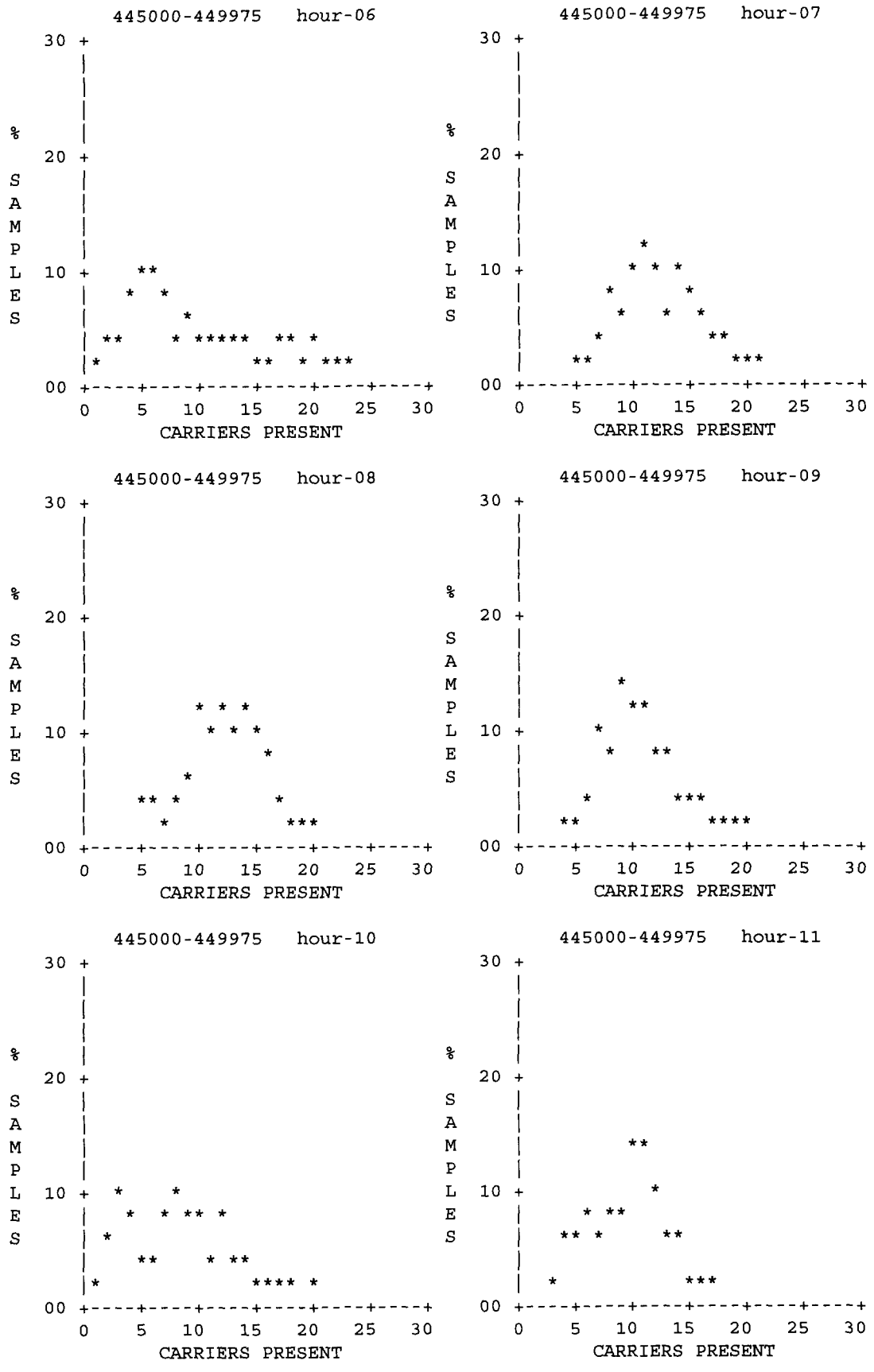
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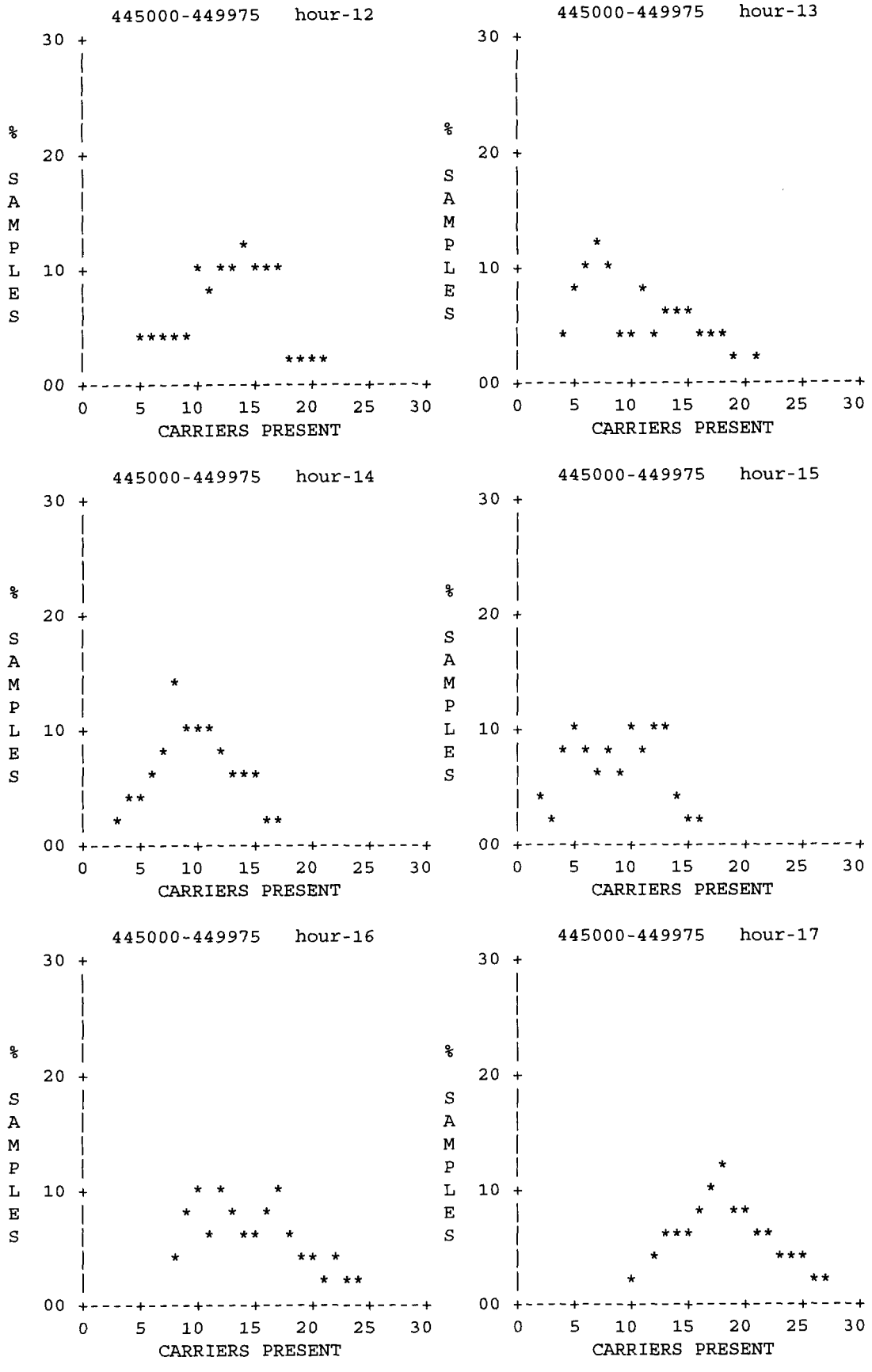
APPENDIX-A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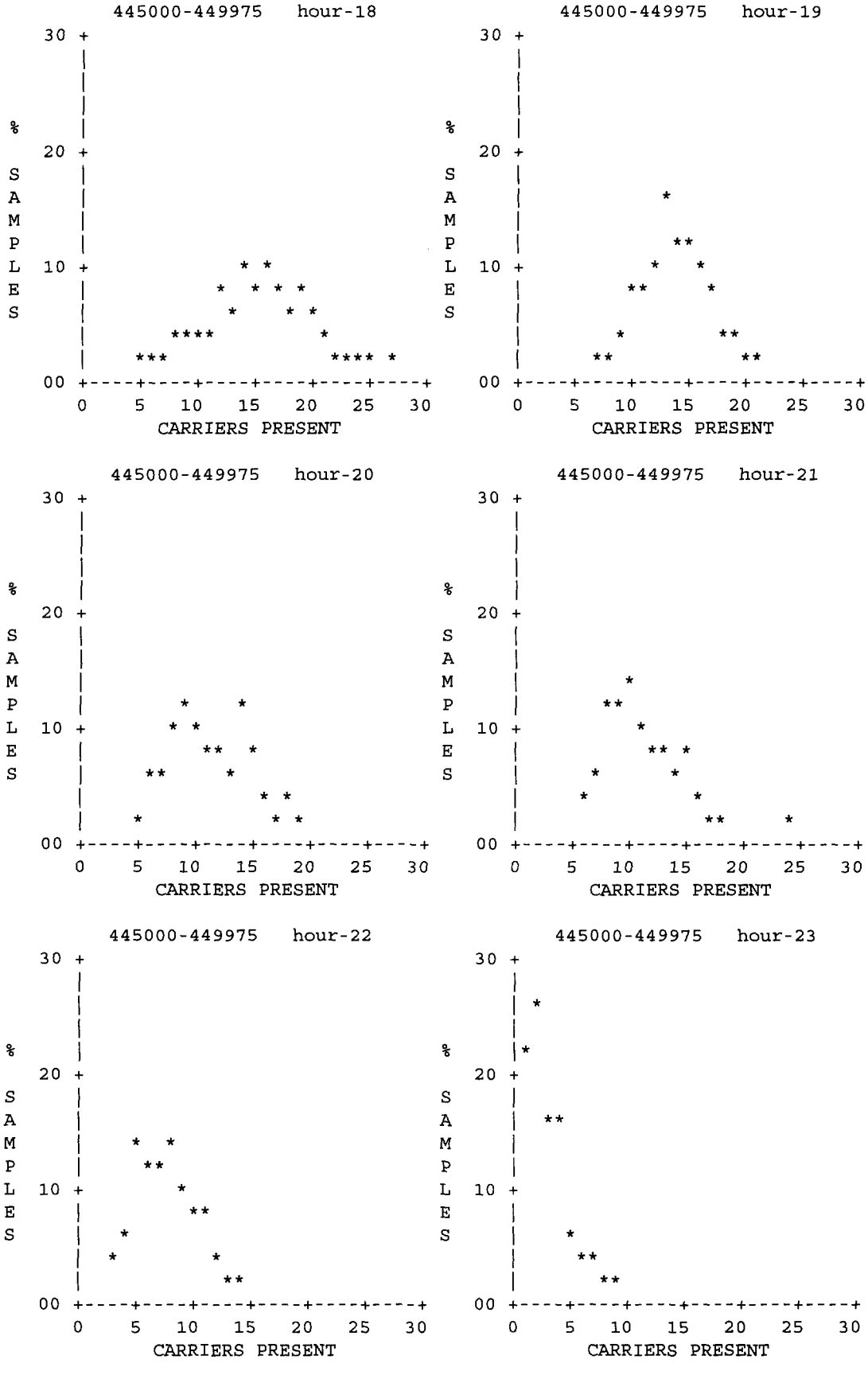
APPENDIX-A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